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ABSTRACT

Reading improvement programs that have focused on additional staff for teaching, tutoring, and counseling; prescriptive, self-paced learning methods; unstructured open-education strategies; and intensive reading have often been successful in small towns and middle sized cities, but none has made a major impact on the reading achievement of adolescents in large city schools. Studies have indicated that while these students do not develop effective reading and learning strategies without explicit training, existing reading instructional methods in the content areas do not provide this type of training. After repeated failures, low achieving students and their teachers develop low expectations that further inhibit learning and achievement. These students need effective comprehension instruction and appropriate learning conditions in order to achieve. There is increasing evidence that mastery learning instructional and testing procedures facilitate reading achievement on both criterion-referenced and norm-referenced tests. There is reason to believe, also, that mastery learning techniques can substantially alter the expectations of students and teachers. A number of mastery learning and learning strategy programs are now in use in large city schools throughout the United States, and other schools are beginning to develop similar materials. (FL)

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MAXIMIZING READING ACHIEVEMENT FOR LOW ACHIEVING STUDENTS: AN ARGUMENT FOR LEARNING STRATEGIES AND MASTERY LEARNING INSTRUCTION

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February 1982

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MAXIMIZING READING ACHIEVEMENT FOR LOW ACHIEVING STUDENTS: AN ARGUMENT FOR LEARNING STRATEGIES AND MASTERY LEARNING INSTRUCTION

In spite of recent developments in theories of knowledge acquisition instruction, and learning, reading achievement is still a widespread and serious problem for inner city youth throughout the U.S. In the past, programs to improve reading have centered heavily on providing additional staff for teaching, tutoring, and counseling; prescriptive, self-paced learning methods; various unstructured, open education programs, and a variety of intensive reading programs. Although many of these efforts have been successful in suburban townships and middlesized cities, none of them has made a major impact on the education of adolescents in large city schools.

This paper is divided into three parts. Part I will consider some important reasons why such diverse efforts in inner city schools have failed to improve reading achievement substantially. More specifically, numerous studies indicate that low achieving students do not develop effective reading/learning strategies without explicit strategy training. Existing methods of instruction in reading in the content areas and in vocational education do not currently provide this type of training and therefore are inadequate for low achieving students. After repeated failures, these students and their teachers develop low expectations which further inhibit learning and achievement.

Part II will consider how learning strategies and mastery learning research address these problems. What is needed is effective comprehension instruction and appropriate learning conditions to break this vicious cycle. Recent laboratory research on the effects of strategy training and augmented texts suggests that explicit instruction in these areas may substantially improve comprehension on classroom measures. In addition, there is increasing evidence that mastery learning instructional and testing procedures facilitate reading

achievement on both criterion-referenced and norm-referenced tests and thereby substantially alter the expectations of students and teachers. Part III will describe briefly examples of instructional materials which incorporate learning strategies and mastery learning instruction.

PART I SOME OF THE PROBLEMS

Strategy Development and Achievement

Throughout the 1970s there has been increasing evidence that a major difference between high versus low achievers and good versus poor readers is the repertoire of learning and reading strategies they use. A strategy is any mental operation or activity that is initiated for the purpose of processing information. Since, in general, strategies which facilitate comprehension also facilitate learning (Jones, Monsaas, & Katims, 1979), we will use the term learning strategies generically to include reading strategies as a subset of learning strategies.

According to Rohwer (1971), high achievers begin at about grade 6 to develop a repertoire of effective learning strategies such that by grade 12 their scores on learning tasks are approximately equal to those of college students. Low achievers evidently rely heavily on rote rehearsal and other relatively inefficient strategies and do not make this developmental shift at any age without intervention. At the same time, explicit instruction in strategy use greatly facilitates learning among low achievers of all ages, but especially during early adolescence. Because of this, Rohwer argued that perhaps educational programs for low achievers should be focused on upper elementary grades (6-8) rather than, or in addition to, the traditional early childhood years.

Rohwer's analysis was limited largely to research on the use of elaboration strategies for learning lists of unrelated items and categorizing strategies

for learning lists of conceptually related items. More recent research not only supports but extends Rohwer's reasoning to other learning tasks and to the development of reading comprehension strategies. Specifically, four types of studies will be examined: studies of good and poor readers, studies comparing two- and four-year college students, correlational studies relating strategy use to achievement, and effects of training studies.

Good and Poor Readers. Studies of good and poor readers indicate that a major difference between them, other than differences in reading achievement, is the nature of the information-processing strategies that they use. This generalization appears to be true for processing words and passages. Mason (1977) found that whereas normal adolescents process words according to their meaning, mentally retarded subjects were unable to consider word meanings in terms of their abstract referents. These findings are consistent with studies of good and poor readers' recall of word lists. Barritt (1969) found that low and high achieving students performed equally well on lists of nonsense syllables, but there were marked differences in recall when word and sentence structure could be employed to aid recall. Similar results were obtained by Weinstein and Rabinovitch (1971). The authors of these studies concluded that the good readers had higher recall of these lists because they were able to utilize the syntactic cues implicit in the meaningfully structured lists.

The situation is much the same with regard to recalling prose. Several studies suggest that differences in recalling prose occurred because good readers consistently selected structurally important idea units. First, Smiley, Oakley, Worthen, Campione, and Brown (1977) obtained these effects among seventh graders who read and listened to narrative prose. Thus, the results could not be due in any way to differences in decoding or reading skills but

rather to comprehension strategies. These results were confirmed and extended in a second study using students in grades 5-12 (Brown, Smiley, & Lawton, 1977) and in an experiment by B. Meyer (1980). Among other things, she found out that proficient readers (young and old) were able to attain high levels of recall regardless of the text structure and presence or absence of emphasis devices such as cue words and illustrations. Obversely, readers who were poor in comprehension and decoding comprehended all texts equally poorly with and without emphasis devices. Meyer argued that good readers are able to form adequate representations of the text structure without the emphasis devices; poor readers apparently need instructional aids to form adequate representations.

Eamon (1979) asked good and poor readers among four-year college students to rate the importance of topical and non-topical statements in selected prose paragraphs. (Topical information is information that is related to the topic of a paragraph or passage.) Good readers not only gave higher ratings to topical versus non-topical information, but also recalled topical statements more frequently, compared to non-topical statements. He concluded that the poor readers are simply unaware of the difference between structurally important and unimportant information.

Tierney, Bridge, and Cera (1979) studied good and poor readers' recall of expository prose. Of particular interest to them was the comparison of good and poor readers' recall of explicit information. Tierney et al found that good readers had markedly higher recall of explicit and inferred information. These data suggest that good readers, in this case third graders, use strategies which involve indepth processing, whereas poor readers do not.

The consistency of these studies is significant. All of them, without exception, found that differences in recall were related to differences in the learners' awareness and use of structural elements within lists and passages; since most of these studies controlled for differences in vocabulary and decoding

skills by using nonsense syllables, oral presentations, or exceptionally low readability levels, the data seem fairly secure.

Junior College vs Four-Year College Students. A second source of data regarding the development of learning strategies among high and low achievers comes from studies comparing the information-processing skills of junior college and four-year college students. Jones (1976) compared junior college students with four-year college and high school students on several tests for diverse learning strategies: elaboration (words), categorizing (word lists), cross-classification strategies (sentences), and reflective test-taking strategies (analogies). She found that on each test the junior college students functioned at about the level of eighth graders or low achieving high school seniors, rather than four-year college students, in terms of strategy use. Similarly, Day and Brown (1980) found that the former were less able to summarize prose passages than the latter, and generally functioned at the level of the seventh graders on several recall and summarizing measures. The results of these studies are consistent with profiles of junior college students (Cross, 1969).

Finally, there is a study comparing the recall of complex prose passages for two- and four-year college students. Marshall and Glock (1978) generated text passages in which four aspects of the text were manipulated: if-then propositions, placement of the main idea, placement of a key clause, and the form of comparative adjectives. They found that none of these manipulations affected the recall of Ivy League college subjects, but they did impair the performance of the junior college students. The authors suggest that there are two populations of readers: the truly fluent reader who can infer the complete text base of a discourse from incomplete information, and the not-so-fluent reader who cannot infer the existence of the structures unless they are explicit. These data and conclusions are, of course, almost identical to those of B. Meyer (1980).

Correlational Studies Relating Strategy Use to Achievement. Auchenbach (1969) developed a test to measure impulsive and reflective test-taking strategies. Impulsive responders often select responses which have a natural language association with some word in the stem of a test question rather than testing out each of the response choices according to its meaning, as reflective responders do. To measure these characteristics Auchenbach devised an analogies test consisting of 68 items. Of these, 34 were normal analogy problems. The remainder contained a foil that was the natural language associate of the third word in the analogy but was in fact the incorrect answer. In the analogy "bear is to cave as boy is to _____," the foil word "girl" is a strong natural language associate of the word "boy", but it is not the correct answer; "house" is the correct answer. Impulsive responding was defined in terms of the proportion of foil responses to other types of errors on the test. Auchenbach showed that associative responding is a stable characteristic in that it persists from about fifth grade to the end of high school in most cases and is highly correlated with grades throughout the school years. Thus, it seems that low achieving students do not attend to the meaning of the words they read in analogy problems and possibly other types of tests as well (Auchenbach, 1971, 1975.)

Jones (1976) used Auchenbach's test for impulsive and reflective responding as one of several measures of strategy use among high school seniors. The other measures for learning strategies, it will be recalled, were measures for elaboration of word pairs, categorizing conceptually related items, and cross-classifying disorganized, cross-classifiable sentences. She found that these measures were highly intercorrelated with each other and with grade point averages. The correlation between the cross-classification strategy and grade point average was replicated in a study of college students (Jones, 1976). Moreover, the same overall pattern of correlations was obtained in a subsequent study of seventh graders (Jones & Hall, 1980a).

Similar results were obtained by Weinstein, Underwood, Wicker, and Cubberly (1979). They developed a learning strategies questionnaire which is administered to students after they take a battery of tasks requiring quite different types of learning strategies. The students respond to the questionnaire in terms of the specific tasks they were administered. Strong correlations were obtained between questionnaire scores and achievement in college.

This correlational data, like all correlational data, would be relatively weak evidence of the relationship between strategy use and performance if it were the only data. Fortunately, it is not. In addition to the studies of strategy use among good and poor readers and junior college versus four-year college students, there are numerous studies which indicate that training low achieving students greatly facilitates their performance.

Effects of Training Low Achieving Students to Use Effective Strategies. Strategic operations may be undertaken in two different modalities: a visual mode in which the learner forms mental pictures of the information to be comprehended or learned, and a verbal mode in which the learner focuses on processing specific characteristics of the text in terms of idea units and relations in words. Forming interactive (physically touching) images of noun pairs; visualizing each event in a sequence of events; elaborating number-name pairs, term-definition sets, name-fact pairs; and drawing pictures are examples of visual strategies. Effects of training low achieving students to use visualizing strategies have been documented extensively in several reviews (e.g., Levin, 1976; Pressley, 1977; Weinstein et al, 1979).

There is also strong evidence that training low achieving students to analyze the text structure facilitates comprehension and recall for a wide variety of texts (using this word in the broadest sense): categorizable lists and sentences (e.g., Liberty & Ornstein, 1973; Jones & Hall, 1980a; McCauley & Kellas, 1974; Schultz, Charness, & Berman, 1973); sequential passages

(Sticht, 1979); complex, multi-level texts (T.H. Anderson, 1979); and texts containing hierarchical relations (Dansereau, McDonald, Collins, Garland, Holley, Diekoff, & Evans, 1979). Moreover, the source of the strategy does not seem to be important. It may be provided explicitly in or with the material, or it may be given in oral instructions.

Interestingly, the same effects can be attained by altering the structure of a poorly written text. This is one way of describing the results of B. Meyer's study (1980) referred to above. Each of the passages she generated had a version in which the text structure was not explicit and several versions containing emphasis devices which highlighted the structure of text (e.g., cue words or signals such as "the problem is" or "therefore"). While the poor readers had low levels of recall for the passage lacking emphasis devices, in contrast, the passages containing these devices apparently influenced their reading strategies and therefore their recall; i.e., the poor readers who read for details were able to perceive and utilize the text structure when it was highlighted by the emphasis devices. Thus, changing the structure of the text evoked a change in reading strategy for poor readers!

To summarize, Rohwer found that low achieving students did not pass through a developmental shift in elaboration and categorizing strategies that high achieving students appeared to make at about grade 6. The argument was supported by four sets of studies: comparisons of good and poor readers, comparisons of junior college versus four-year college students, correlational studies, and effects of training studies. Thus, there is consistent evidence that low achieving students do not develop the repertoire of learning strategies that high achieving students develop. Especially important, it seems, is the greater awareness and utilization of underlying text structure among high achieving students, compared to low achieving students. This applies to every level of learning, from words and word lists to sentences and prose passages.

At the same time, it is clear that low achieving students can attain high levels of performance with explicit strategy instructions.

In view of these facts, it may be reasoned that what is needed most are (1) instruction in school that provides explicit comprehension instruction and (2) text passages in which the structure of the text is made explicit by emphasis devices. Yet comprehension instruction and explicit text passages are sadly lacking in schools.

The Quality of Instruction in Schools and Basal Systems

Durkin (1979) distinguishes between comprehension instruction and comprehension assessment. Comprenension assessment consists of the teacher asking the student "who", "what", "when", "where", "why", and "how" questions without helping them comprehend the text in any way. Comprehension instruction is any effort to help the student understand the meaning of a unit that is larger than a word. Durkin observed 24 classrooms in different schools during the reading period. Of 4,989 minutes of observation only .63% (28 minutes) were devoted to comprehension instruction. The remainder of the time was devoted to comprehension assessment (17.43%) or noninstruction! Additional observation during instruction in the content areas yielded similar results. Worse still, Durkin documented repeatedly a pattern of teachers shifting rapidly (within minutes) from one unrelated activity to another in the reading periods and in subject area periods. Thus, for example, the teacher might spend several minutes asking the students to identify the topic sentence, then switch rapidly to an activity involving dictionary skills.

Durkin's research is consistent with numerous studies of academic learning time. Apparently, even good teachers have a substantial amount of time that is transitional or noninstructional: about 10% of the available instructional time. This percentage increases greatly for average and poor teachers: about 15% and 37% respectively (Rosenshine, 1978).

Why does this problem exist? Durkin suggests that teachers do not provide adequate comprehension instruction because there are no useful definitions and methods available to teachers in basal readers and teacher training institutions. After a systematic search of the relevant teacher training literature, Durkin found only a handful of vague, useless definitions of the word "comprehension". Moreover, Rosenshine (1980) examined over 20 basals and found that not one of them contained a useful definition of a main idea or instruction in how to identify one (see Collins, Brown, Morgan, & Brewer, 1977). More recent studies have found inadequacies in the teacher manuals and student workbooks as well as poorly written texts (e.g., Armbruster & T.H. Anderson, 1981; Bruce, 1981a; Bruce, 1981b; Bruce, Rubin, & Starr, 1981; Davison, 1981; Durkin, 1981; Osborn, 1981).

Another explanation may be found in the general inadequacy of staff development programs. Joyce and Showers (1980) reviewed over 200 studies of teacher training models, many of which involved efforts to improve reading instruction. They found that no single program contained all of the components that would yield a strong impact at the level of classroom applications and problem-solving.

Thus the failure to provide comprehension instruction in the classroom is not really the fault of the teachers. Rather, it appears to be largely a function of neglect; there simply has been no attention paid to the problem of defining comprehension instruction in texts and teacher education institutions that are available to teachers.

PART II SOME SOLUTIONS

Learning Strategy and Structural Information as Comprehension Instruction

Whatever the cause of poor comprehension instruction in the schools, it may be argued that its effects on low achieving students must be greater than on high achieving students. But to say that methods of comprehension instruction

are currently unavailable to teachers does not mean that they do not exist. To the contrary, it is reasoned that many, if not most, of the principles of comprehension instruction exist in two related areas of cognitive psychology: learning strategy research and research on knowledge acquisition, especially studies of the effects of providing structural information; i.e., informing the learner of the structure of the text. In some of these structure-of-text studies the instruction may be as simple as providing the student with an outline before reading (e.g., Glynn & Di Vesta, 1977). In others the students are informed about the nature of the sentence organization for each different type of passage (e.g., Jones & Hall, 1980a; Perlmutter & Royer, 1973). In learning strategies research the students are taught to use specific strategies such as visualizing the elements in a definition or passage in such a way that that structure and content are clarified (e.g., Levin, 1973). In both structure-of-text and learning strategies research, the instructions given constitute comprehension instruction because they help the students to understand the meaning of what they read. Thus, it may be argued that there are already two relatively well-defined methods of comprehension instruction. The problem is that there seems to be no effective means of communicating and applying what is known from basic research about the process of comprehension to teacher training institutions or to teachers in the classroom.

How can learning strategies and structure-of-text concepts be utilized to facilitate comprehension instruction? One solution would be to include structural information or learning strategy instructions within the instructional materials used by the students. In fact, such materials have been developed and tested (T.H. Anderson & Armbruster, 1979; Dansereau, et al, 1979; Englemann and his associates, 1978; Jones & Hall, 1980a, 1980b; Jones, Monsaas, & Katims, 1979; Reid, 1978; Sticht, 1979; Weinstein, et al, 1979); some of these will be discussed further in Part III. Second, there are some excellent texts which show teachers how to apply learning/reading strategies to the content areas (e.g.,

Herber, 1974) at the high school level. Third, there are also several papers which describe or provide effective instructional procedures to teachers (e.g., L.W. Anderson & Jones, 1980; Barber, 1979; Case, 1978; Jones, 1980; Reid, 1978; Rosenshine, 1978; Stoll, 1980, 1981; Tierney, Readence, & Dishner, 1980). Fourth, what is needed, in addition to the materials described above, are efforts to train teachers to apply learning strategy instruction and transfer training to any text: commercial texts, teacher-developed materials, and occupational training manuals. It is reasoned that these efforts would improve the quality of comprehension instruction and simultaneously the development of a repertoire of learning strategies in the students.

Besides learning strategy concepts, there are two other areas of research which are not in themselves comprehension instruction according to Durkin's (1979) definition but are nevertheless important in attaining effective comprehension instruction: metacognitive strategy research and experiments on the technology of written instruction. Metacognition refers mainly to the individual's awareness of what information has already been acquired, what information is lacking or poorly understood, and what procedures are needed to acquire missing or poorly understood information (Brown, 1978). Several studies indicate that poor readers do not develop metacognitive strategies and that metacognition training facilitates comprehension. Brown, Campione, and Barclay (1978) trained students to use a study/self-test/study technique to identify what information was acquired and what was lacking. Dansereau et al (1979) and T.H. Anderson (1979) regularly train students to mark portions of the passage that they do not understand as part of their study skills program.

Instructional technology refers to techniques of presenting information, such as the use of adjunct questions (e.g., Andre, 1979), advance organizers (e.g., Ausubel, 1978), the spacing of the printed words (e.g., Frase & Schwartz, 1979), the use of pictures within texts (e.g., Lesgold, De Good, & Levin, 1978),

sequencing (e.g., Case, 1978; Rosenshine, 1978; Stoll, 1980), and effects of different types of passage organization in name or attribute categories (e.g., Musgrave & Cohen, 1971; Frase, 1969). It would seem that teachers and administrators could benefit greatly from instruction about metacognitive strategies and instructional technology.

To summarize, a major problem among low achieving students is that they do not develop the repertoire of effective learning and metacognitive strategies that high achieving students seem to develop. This variable is clearly alterable, however. We can increase comprehension and retention among low achieving students in two ways: by providing explicit strategy instruction and by providing explicit text structures. Classroom research indicates that low achieving students are not receiving either type of instruction because existing teacher education programs characteristically do not provide instruction in strategy training and because basal reader passages are lacking in emphasis devices and are frequently poorly written. It was argued that concepts and principles from learning strategies research, metacognitive studies, and instructional technology research could be used to develop learning strategies, instructional materials, and teacher training programs which would increase effective comprehension instruction in the classroom and therefore reading achievement and job effectiveness.

Mastery Learning Instructional Procedures

Comprehension instruction must take place within a given set of instructional procedures. Traditional instruction systems frequently ability-group within classrooms on the assumption that poor readers typically cannot substantially alter their reading ability and therefore should not have to deal with materials that are too difficult. This system of instruction is antithetical to comprehension instruction as it has been defined above, emphasizing learning strategy concepts. These concepts assume (1) that poor readers can comprehend

difficult materials if they are taught appropriate learning strategies and (2) that they can profit greatly from exposure to the learning/reading strategies of good readers. To teach learning strategies effectively in the classroom, it is useful to provide instructional procedures such as mastery learning which are consistent with learning strategy assumptions and practices and also are effective for low achieving students.

The mastery learning concept derives, of course, largely from Bloom (1968). He argues that children do not fail because they are unable to learn. Rather, they fail because they lack sufficient prerequisite skills, because they have negative feelings about school and their ability to perform in school, and/or because the method of instruction is not appropriate for them. These problems arise in part from the practice of comparing a student's performance to that of his/her peers (e.g., grading on a curve). If we use criterion-referenced tests and teach using mastery learning practices, all children can learn, according to Bloom.

Particularly important in creating appropriate learning conditions is organizing instruction in terms of a series of learning units. Each unit is addressed to one or more objectives which are known to the student. Minimally, each unit includes initial instruction and practice for the entire class as a group, a formative criterion-referenced test, corrective instruction (using a different teaching strategy) for those who need it, and a second, parallel test for these students. Thus, this model utilizes both group instruction (before the first formative test) and individualized instruction (after the formative test), and is a highly efficient model of managing the process of instruction.

Because of these added learning opportunities, all or most of the students are able to master the objectives for each unit and are prepared for the next unit, because they have the necessary prerequisite skills. That mastery

learning works for students in inner city schools is evident from several studies (e.g., Barber, 1979; Block, 1980; Burns, 1980; Hyman & Cohen, 1980; Jones, Monsaas, & Katims, 1979). Moreover, evidence from other studies indicates that successful students are more likely to have a positive, academic self-concept and attitude toward school (Coleman, 1966; Kifer, 1973; Torshen, 1969). As students experience repeated success in school, the likelihood that their attitude and self-concept will improve is greatly increased. Increasing the proportion of successful students in a class has an effect on the teacher's attitude as well. Teachers begin to feel better about teaching, take more responsibility for student achievement, and have higher expectations for the students (Guskey, 1980).

This model contrasts sharply with traditional models of reading instruction in several respects. First, whereas the initial instruction in a mastery learning model is typically taught to the entire class, traditional approaches may involve instruction of various ability groups within the same classroom. Consequently, the traditional teacher may allocate time to work with only one group at a time while the other groups complete different seatwork assignments unassisted by the teacher. Thus, there is far more interaction with the teacher in the mastery learning model described above. Second, traditional classrooms typically involve tests which are widely spaced and require much guessing about what is to be tested and what type of test will be given, compared to the frequent testing and public specification of test coverage and format in the mastery learning model. Third, traditional instruction typically involves only two phases, teach and test. This allows students with learning errors and misunderstandings to proceed to the next unit of instruction without correction, and thereby typically generates a normal distribution achievement curve. Mastery learning typically involves four phases of instruction: teach, test, reteach, and retest. Mastery learning thereby prevents learning errors from being accumulative.

It also provides an opportunity for a change of grade status (from fail to pass), thereby further increasing their chances for success on later units and their positive self-concept. The result of this repeated success is an increasingly skewed curve, with marked shifts of students moving from the low end of the scale to the high end; the more learning units and tests, the greater degree of skewness. In effect, traditional models usually involve a wide variance of learning outcomes while mastery learning consistently decreases the variance. These differences in learning outcomes have been documented extensively (e.g., L.W. Anderson, 1973; Block, 1970; see also Ryan & Schmidt, 1979, for a recent overview of mastery learning research).

Mastery learning also differs from objectives-based curricula using instructional procedures without the feedback, corrective, and parallel test components. Such programs are frequently used in military programs of instruction (Logan, 1979) and in many competency-based educational programs. While these programs may be referred to correctly as being mastery-based because they involve mastery of specific objectives, they are not in fact mastery learning programs unless they involve the crucial feedback, corrective, and "second-chance" criterion-referenced test measures of mastery of the objective. These components are the heart of the mastery learning concept developed by Bloom (1968). And although there are no data comparing mastery-based procedures and mastery learning, informal feedback at mastery learning conferences everywhere suggests that the mastery learning feedback, corrective instruction, and second test are the critical components in the success of mastery learning programs. (see also Jones, 1982).

It is evident from these comparisons that mastery learning models are more consistent with memory research than traditional approaches and objective-based instruction without feedback and correctives. The frequent testing covering relatively small amounts of materials on the mastery learning model

not only relieves the heavy memory load imposed by traditional models but also encourages effective study habits because it forces the student to adopt spaced versus cramming study procedures and utilize diverse context clues (Shimmerlik, 1978). Moreover, the mastery learning reteach/retest procedure is obviously a close equivalent of the idea of teaching to criterion in learning experiments, a procedure which is used to equalize learning for experimental subjects in different treatment conditions. Finally, it is possible that the task analysis and sequencing that Bloom specifies for teachers and curriculum writers to use to develop mastery learning materials yield a greater degree of conceptual organization (clustering factual information in terms of highly specific skills and content categories) than traditional modes of instruction. Thus, mastery learning theory has within it concepts and procedures which are equivalent to concepts and procedures from learning research.

PART III EXAMPLES

In Part I it was argued that low achieving students do not develop the repertoire of effective learning and reading strategies that high achieving students seem to develop. At the same time, it was also evident that low achieving students can be taught to process information effectively by learning strategies and mastery learning instruction. But most of the studies cited were basic research. This section will consider several programs of instruction which are in use in schools and universities.

Learning Strategy Programs

The most well-planned programs of learning strategy instruction actually used in the field are those developed by Weinstein et al (1979), Brown, Campione, and Barclay (1978), T.H. Anderson (1979), Amiran, Jones, and Fridell (1980); described in Jones, Amiran, and Katims (1982), Dansereau et al (1979), Sticht (1979), and Anderson, Smart, and Raisbeck (1981). Most of these are described in O'Neil (1978) and O'Neil and Spielberger (1979).

Weinstein offers a semester course at the college level but there is no reason why such a course could not be offered in high school or a modification of it in junior high school. In Weinstein's course the students are taught to use a variety of elaboration skills: visualizing, making up stories which relate the meaning of new concepts to old concepts, creating interactive images which relate essentially unrelated words or information into one concrete image in which the referents for each word are physically interacting or touching. These strategies are especially useful for learning uncategorizable, difficult-to-learn passages or graphic information such as the digestive system. Weinstein's program also has a problem-solving component and a stress management component as well as a Learning Strategies Questionnaire referred to above. The latter has been validated and may be available for public use in the near future. It appears to be a useful instrument for diagnosis and instruction.

Brown and her associates have not developed a course or system of instructional materials, but reading about their research on metacognitive strategies would be useful for any teacher or administrator since the study procedures they have developed (e.g., estimating test readiness) can be applied to any classroom. Moreover, it is possible to apply any of the study skills they have developed to most learning situations. The rules of summarization developed and tested by Day and Brown (1980), for example, could be adopted in any number of reading and content area courses.

The outlining materials developed by Dansereau, Anderson and others are quite similar in their function and approach. First, each set of materials constitutes a system of classifying, studying, and outlining information which contains multiple levels of ideas and details, and different types of information. The names for these three systems are network outlining, mapping, and matrix outlining respectively. Second, these materials share the assumption

that the traditional form of outlining, linear outlining, is inadequate because (1) there is no way to differentiate different types of information such as cause-and-effect or names and attributes and (2) there is no way to indicate relations between different sets of superordinate and subordinate ideas and details or information that is lacking in parallel structures. Third, each system provides the student with instruction and practice in a variety of information-processing techniques such as paraphrasing and inference as well as complex metacognitive strategies.

The major differences between these systems are the method of outlining and the tasks to which they are addressed. Network outlining requires the student to outline ideas, relations, and interrelations in nodes and branches which form hierarchically organized "tree" networks. This system was designed to facilitate free recall, performance on comprehension tests, and written assignments for expository and descriptive essays. Mapping requires the student first to classify all information into one of eight types and then to construct a written map of the information. The location on the page and symbols denote the type of information and interrelations of ideas.

Matrix outlining involves classifying cross-classifiable information into name categories (e.g., names of nations) and attribute categories (e.g., birth rate, rituals, type of economy). The information is then outlined in two-dimensional tables or matrices. Thus, in passages describing India and England the names of each nation became the column headings while the topic or attribute categories became the row headings. Key words for the main ideas and details related to each name/attribute category set are placed in the cells. Once the information is organized in this way, it can be analyzed for row and column patterns such as trends, range, and covariance. It is also possible to use the organization of the matrix as the basis of the organization for a compare-and-contrast essay. Thus, the row generalizations may be used as the topic sentences

with the information in the cells as the body of each paragraph. The row and column headings and the column generalizations may be used as parts of the introduction and conclusion respectively. In this system the student learns to form and write over fifteen different types of analytical generalizations.

The programs developed by Sticht (1979) and by Anderson, Smart, and Raisbeck (1981) are highly innovative in that they integrate appropriate study skills/learning strategies instructions in each instructional unit. In each program, the students must comprehend a specific set of texts. In the program developed by Sticht (1979), the texts are military occupational course materials. Sticht categorized several hundred military occupational texts according to their text structure. He found that the vast majority of texts fell into two categories: name/attribute texts in which the attributes of several similar items were described at length (e.g., the attributes of different weapons, the attributes of different military uniforms), and sequential texts in which the students must learn the steps in a process (e.g., how to cook chicken). For name/attribute texts, Sticht required the students to transform the text in a two-dimensional chart; for sequential texts, the students were required to transform the information into a flow chart. The program currently being developed by Anderson, Smart, and Raisbeck is called the Rochester Reading Program, which is a remedial program for low achieving high school students. Each set of materials consists of a tabloid (reader) which includes high quality, high interest expository prose, fiction, and poetry; a set of student skill sheets which require the students to use appropriate oral reading and information-processing strategies such as outlining, summarizing, and contextual analysis for specific readings; and teaching activities related to each text. Thus, learning strategy instruction in these programs is content-driven in two ways. First, unlike adjunct courses, the learning strategies in these programs apply directly to the content to be learned for the course. Second, the content determines the

nature of the strategy to be learned. Both programs are mastery-based in that learning is addressed to specific objectives, and there is a strong emphasis on the correction of learning errors in both programs. Additionally, the military materials include mastery tests and prespecified levels of mastery.

How can these materials be used since they are not yet commercially available? All of the research groups which developed these materials have papers describing their research in language that is relatively free of discipline jargon and complex statistics. Administrators, resource teachers, and regular classroom teachers can read these papers and apply the ideas in ways which fit their particular needs. Gradually, as more school administrators and teachers become aware of these ideas and their school applications, they can ask publishers to apply them to commercially developed materials.

Mastery Learning Programs

According to Hyman and Cohen (1980), there are about 3,000 schools using some form of mastery learning. Incredibly, most of these were locally developed for specific age groups, subject areas, objectives, and procedures for instruction, classroom management, record keeping, and monitoring. Moreover, most mastery learning programs do not provide all of the instructional materials. Typically, groups of teachers, curriculum writers, and consultants develop objectives, parallel forms of criterion-referenced tests for each objective or key objectives, and corrective activities. Frequently, instructional activities are specified by referring to readings and activities that are given in specific texts. Alternatively, diverse texts and teacher-developed options are listed for given objectives so that each teacher can select from the list according to his/her judgment. Thus, most mastery learning programs are highly specific to local conditions.

The most well-known programs perhaps are in Denver, Chicago, New York City, Red Bank (N.J.), Dallas, Johnson City (N.Y.), and South Carolina because these

systems have developed instructional and/or staff development materials which are fully transferable to other systems, because they have been thoroughly field tested and refined, because they have obtained outstanding results, and/or because they have been well-publicized in papers at professional conferences and in journals. Most of these systems have been described recently in the November, 1980, issue of Educational Leadership. Moreover, the reviews in that issue (Block, 1980; Burns, 1980; Hyman & Cohen, 1980) indicate that mastery learning theory can be adopted in many variations and that it is a highly effective method of teaching students at all levels of reading ability, but especially it would seem for low achieving students.

Since most of the instructional programs of each of the cities given above have been described in the 1980 issue of Educational Leadership and/or by the various authors, this section of the paper will focus on identifying some of the key variables that differentiate different types of mastery learning programs. Essentially, there are two key program variables -- the mode of delivery and instructional management -- which are tied to a critical school variable: the size of the school system. While these variables are not usually discussed in connection with reading research or curriculum development, implementation variables may greatly affect the impact of a given program of instruction, and it is argued here that such factors should be considered in developing a curriculum.

Mode of Delivery: Staff Development vs Curriculum Development. There are several good mastery learning staff development models. Outstanding are reading programs developed by teachers in Northglenn, Colorado (Bailey & Guest, 1980); in Chicago (Caponigri et al, 1981); in Johnson City, New York (Champlin, 1981); in Salt Lake City, Utah (Reid, 1978); and in Philadelphia (Kopple & Connor, 1979). In this model, consultants train local teacher trainers to develop instructional materials and tests to implement the classic four-phase mastery

learning cycle of instruction: teach, test, reteach, and retest. Then, these trainers teach individual teachers to develop their own materials for each learning unit (e.g., Bailey & Guest, 1980), to correlate the basal exercises to mastery learning objectives (e.g., Reid, 1978), and/or to use some commercially published mastery learning materials (e.g., Champlin, 1981). Additionally, there is an excellent staff development program developed by Barber (1979) who has trained principals to implement mastery learning in their schools; this training includes a heavy focus on teacher training. Kopple and Connor (1979) also train teachers but their program has a unique affective education component. Generally speaking, these programs have evolved a gradual diffusion model of implementations, though in some instances mastery learning was mandated from the central administration.

The argument for staff development is strong. First, teachers need to enhance their effectiveness in the classroom. Mastery learning is an effective method of instruction; therefore teachers should be taught to use it. Second, teachers tend to use a new program more effectively if they have a sense of "ownership" in the program and its products. Teaching them to develop their own materials is a means of generating ownership.

Against this argument is the notion that teachers do not have the time, energy, or desire to be effective curriculum developers. Moreover, large cities have high rates of teacher mobility from administrative transfer, court rulings for desegregation, absenteeism, "bumping" in times of reorganization and reduction of staff, leaves of absence, and so on. Each teacher who is trained and changes jobs involves a double-edged cost: the loss of the trained teacher and the cost of training a new one. And each movement of a teacher, whether it is a transfer or a day's absence, is a loss of teaching/learning time for the students unless they have a standardized set of instructional materials which are easy to use with a minimum of inservice. When one considers that the

number of teachers in the entirety of many small school systems could be housed in a few large schools in a big city system, it is possible to see that what may work in a small school system may be inappropriate in a large school system.

For these reasons and others (see Jones, 1982; Katims & Jones, 1981a) it is argued that of the two methods of developing instructional materials, staff development and curriculum development, the latter is better for large school systems. Standardized materials exert a considerable amount of control over the quality of instruction by controlling its content, define a standard of performance that is clearly specified at each grade level, allow transfer students to move from one school to another more easily, allow substitute teachers to carry on instruction when teachers change jobs or are absent, and facilitate setting instructional goals and monitoring.

Incidentally, there is a new method of curriculum development involving school publisher collaborations that should be of great interest to schools, curriculum developers, and publishers. In one method (e.g., in Chicago) the Board of Education developed its own materials and then contracted with a commercial publisher to print and distribute them (nationally). In the other method (e.g., in Rochester, N.Y.) the Board of Education asked the publisher to develop a set of instructional materials according to its own specifications. In both methods the school systems in question receive sizeable discounts for local sales and royalties for national sales.

Instructional Management. This variable really refers to two sets of related variables: whole group versus individualized instruction and teacher-paced versus self-paced instruction. Bloom (1976) has argued that mastery learning increases the rate of learning for all mastery learning students and there is strong data to suggest that this is true (e.g., Burns, 1980). However, Arlin (in progress),* and Mevarech (1982), and others have found recently that

*personal communication

while low achieving students may indeed learn faster under self-paced mastery learning conditions, compared to conventional individualized instruction, self-paced instruction such as that found in continuous progress may create and maintain increasingly larger differences between the high and low achieving students. This happens because systems such as continuous progress frequently assume that low achieving students are unable to progress at a rapid rate of learning. Therefore, little effort is made to set instructional goals or to pace these students. The result all too often is that they may make little or very slow progress, compared to high achieving students. Moreover, in classrooms involving individualized instruction or even 2-3 small groups, each student has only limited direct instruction from the teacher. While average and high achieving students may progress in spite of these conditions, low achieving students seem to respond best to a maximum amount of direct instruction. Thus, in mastery learning involving individualized instruction or traditional achievement grouping within classrooms, the gap between high and low achieving students may become increasingly larger over the years.

This situation contrasts sharply with mastery learning with augmented whole group instruction. In this model, the teacher moves the entire class through a series of learning units giving extra time and instruction only to those who failed the first test (in the teach, test, reteach, retest cycle), while those who passed the test engage in enrichment activities which extend their learning. Thus, the whole group instruction is augmented with individualized instruction during the reteach/retest phase. The term augmented whole group instruction is used to distinguish this type of whole group instruction from traditional group instruction in which the teacher constantly "teaches to the middle group" in a two phase teach/test cycle and thereby never directly addresses the needs of high or low achieving students.

Additionally, augmented whole group instruction is usually teacher-paced

to move the group through a specified number of instructional units in given time periods. This is to assure that a certain amount of instruction is covered. This procedure is entirely consistent with research on the relationship between content covered and reading achievement. Rosenshine (1979), for example, has reviewed classroom research studies which assess this relationship. And unlike many other areas of research, the data are consistent. There is a strong positive correlation between content covered and achievement: the greater the content covered, the greater the gains. Therefore, it stands to reason that students who work through more mastery learning units are likely to have higher achievement gains than those who work through fewer units.

With regard to existing mastery learning programs, only three involve teacher-paced, augmented whole group instruction: the Chicago Mastery Learning Reading Program (Katims, Jones, & Adelman, 1981) in Chicago and other cities where it is used; a mastery learning program in Beirut (Reed, 1982), and the mastery learning program in Red Bank, New Jersey (Abrams, 1979, 1981). All the rest involve individualized instruction, small group instruction, or a combination of the two. Unfortunately, there is no data comparing the various methods (augmented whole group vs individual or small group). However, Katims and Jones (1981b) have data on the Chicago program indicating that it does in fact reduce the variance between high and low achieving students.

It is important to point out, however, that two things are not being argued here. First, it is not the case that self-paced instructional arrangements must necessarily allow slow pacing to predominate. Student contracts, cooperative student/teacher goal setting, rewards for increased rates of learning, and combinations of self-paced/teacher-paced arrangements are just some ways to increase the content covered in self-paced arrangements. In fact, there are some excellent examples of this (e.g., Champlin, 1981), but there is currently no data regarding the effectiveness of such procedures. Also, it is important

to note that monitoring individualized programs may be effective in some school contexts but not in others. It may prove to be the case, for example, that goal setting and monitoring of individuals and small groups may be effective only in systems in which there is a small student-teacher ratio, a widespread "top-down" commitment to goal setting and monitoring from the central office, and the money for staff development as well as for staff to monitor the teachers. None of these solutions would be likely to be effective in a citywide basis in a large city because of the problem of student and teacher mobility.

Second, it is not being argued that high achieving students should not be allowed to grow at the maximum rate. Group-based mastery learning requires only that all students attain the criterion level of competence on prespecified objectives, so that high and low achieving students are equal with regard to each criteria. It has never been argued that high achieving students should not be encouraged to achieve the maximum growth in any number of enrichment or supplementary instructional activities.

Mastery Learning/Learning Strategy Programs

In this section several sets of printed or published materials are described which combine mastery learning with learning strategy training for students or with teaching strategies which involve the student in effective information-processing procedures.

There is a handbook entitled Interactive Comprehension Instruction developed by the Bureau of Reading in the New York State Board of Education (1978). The concept of interactive comprehension assumes that in order for comprehension instruction to be effective the learner must somehow mentally interact with the instructional materials or information to be learned. The purpose of this manual is to provide teachers with the rationale and instructional strategies for teaching a limited number of information-processing strategies such as paraphrasing, use of context clues, and inference. For each

strategy there is a general instructional model with examples showing classroom applications. The manual is meant to be used with students of all ages, but it seems especially appropriate for students from grades 4-10. There are no data available at the present time regarding the use of the manual other than the demand for it. Currently, it is in its fifth printing.

A far more extensive system of instructional materials for teachers may be found in the mastery learning program developed by Barber (1979) and Reid (1978) to teach reading. Neither of these materials purport to teach learning strategies, but both sets of teacher manual materials provide the teacher with teaching strategies which effectively guide the students to process the information or skill (1) by using a sequencing model which constantly relates the new information or skill to be learned with previously acquired knowledge, (2) by relating each step in the instructional sequence to the objective, and (3) by providing for systematic correction procedures. Reid uses three other information-processing techniques as well. First, all of her materials require constant and rapid responding to questions which require recalling the information to be learned and then subsequently applying that skill or concept to new instances. Second, she has developed several teacher manuals which teach information-processing techniques by teaching study skills, critical comprehension strategies such as inference, and use of context clues. Third, for every skill that is learned, the teacher guides the student through a series of adjunct questions and statements which constitute a model of the thinking/learning steps that are needed to master the objective.

While DISTAR proponents might be quite surprised to see DISTAR classified as a learning strategies/mastery learning instructional system, DISTAR shares several of the characteristics listed above for the Barber and Reid materials: the sequencing model that consistently links new information to previously learned information, the rapid response to answers requiring memory, and the

systematic correction procedures. DISTAR materials also use adjunct questions and statements to force the student to use the underlying thinking steps that are needed to attain mastery. In fact, the author recently saw an amazing demonstration of these procedures in an East St. Louis DISTAR site. Child after child in a third grade reading and math class demonstrated the ability to multiply and divide three-digit numbers and fractions by asking themselves (out loud) a series of information-processing questions. The same students were able to answer application and synthesis questions for a unit learned four months in the past: a unit on the eras of time involving the knowledge of the life forms in each era (not to mention the pronunciation of the names of each era, which is no small task in itself). The limitation of DISTAR is, of course, that the materials do not extend beyond fifth grade except for the Corrective Reading series.

The final set of materials to be described are the Chicago Mastery Learning Reading (CMLR) materials for students from kindergarten through eighth grade. The development of these materials was sponsored jointly by the Department of Research and Evaluation and the Department of Curriculum for the Chicago Public Schools (see Feiock, 1980; Jones, 1980; Jones, Monsaas, & Katims, 1979; Katims, 1980; Katims, Smith, Steele, & Wick, 1977; Mann & Fridell, 1980; Monsaas, 1980; Thompson, 1980). The materials contain four component parts. First, there is the mastery learning component which, unlike most other mastery learning programs, provides a complete package of all of the instructional materials needed for the four phase (teach, test, reteach, retest) cycle of instruction for teaching and testing for grades K-8. Second, CMLR units use a sequencing model which builds in the prerequisite skills for each unit. This allows the materials to be used effectively in classrooms that are heterogeneous as well as in homogeneous classrooms. Third, CMLR utilizes an innovative readability formula developed from recent research on

text structure, schema theory, and learning strategies (Amiran & Jones, 1982). This formula focuses on (1) the degree of structural complexity (e.g., the number of component parts of a passage); (2) its texture, that is, the degree of inference needed for comprehension, and (3) the density or memory load. The amount of world knowledge and the learning strategies required for comprehension were also considered.

Fourth, CMLR units provide structure of text information and explicit learning strategy instructions in what may be referred to as an embedded curriculum; i.e., structure of text information and learning strategies instructions are embedded in the instructional text. These instructions guide the student (1) to use specific modes of encoding and analysis (visual and verbal) and reasoning (deductive and inductive); (2) to analyze the structure of the text both when it is explicit and when it is implicit; (3) to use specific test-taking strategies. These instructions are given by means of "thinking aloud" models and self-addressed adjunct questions ("ask yourself") and prompts ("think," "note," "remember"). Altogether, there are four levels of adjunct aids: step-by-step thinking instructions, content-specific instructions showing the student how to apply the skill or concept to one or more specific examples or exercise problems, generalized instructions without any reference to a particular content, and finally no strategy instructions. Thus, by the end of the activity or unit, the student is working independently on new problems or applications without any adjunct aids. Jones (1980) has described the learning strategies and use of adjunct aids; her paper includes a taxonomy of learning strategies which are linked to specific tasks, a typology of text structures typically found in basals and content area tasks (see also Jones, Amiran, & Katims, 1982).

While it is obvious from the paucity of available materials that both learning strategies and mastery learning are relatively new fields, what is

outstanding is the consistency of the positive results in the laboratory and the classroom. This consistency is not surprising since each set of instructional materials described above was derived systematically from theory and research and then field tested using extensive teacher and student interviewing, classroom observations, error analyses, and exploratory research. Finally, there is also the beginning of a body of mastery learning/learning strategies implementation literature which provides conceptual models and guidelines for every phase of implementation: policy, curriculum development, staff development, classroom management, research, and monitoring. Hopefully, this body of literature will be crucial in sustaining learning strategies and mastery learning instruction as a stable and effective alternative for low achieving and average students.

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